

SR 530 / Sauk River Corridor Study

Final report
December 29, 2009



**Washington State
Department of Transportation**

**Washington State Department of Transportation
Northwest Region / Mount Baker Area**

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Executive Summary

Each year, the constantly shifting Sauk River threatens collapse of the roadway. Since 2003, WSDOT spent in excess of \$6.1 million on SR 530 between MP 50.0 and 65.0 to address conflicts between the highway and the Sauk River. Rather than continuing to perform repetitive repairs, Tribes and regulatory agencies requested that WSDOT consider moving the entire highway (or considerable portions of it) to avoid trouble spots. The corridor study is in response to the requests and fulfills our commitment to those tribes and regulatory agencies to explore relocation and realignment options.

WSDOT worked closely with tribes; federal, state and local agencies; property owners; and other stakeholders through one-on-one interviews and working group meetings. Our technical analysis of six relocation/realignment options suggested that minor realignments and armoring (i.e. log crib wall treatments) are the most promising strategies for providing benefits in the next 20 years. We concluded that proceeding with the programmed minor realignment at MP 59.5 is the most beneficial next investment to address conflicts between SR 530 and the Sauk River.

Key findings

- The only options that provide benefits in the short-term (and even in the next 20 years) are imminent threat projects (such as the 2008 log crib wall at MP 59) and minor realignments. **WSDOT recommends that we proceed with these improvements, including the partially-funded realignment at MP 59.5.**
- Emergency actions (such as rip rap revetments) allow little time to adequately assess and address potential impacts to fish habitat; typically require intensive maintenance; and have a relatively short life span. Such improvements reduce the quality, distribution and type of fish habitat.. **WSDOT only supports this option as a last resort to avoid or respond to roadway failure.**
- Two of the relocation options proposed by stakeholders – the eastern relocation and western relocation to Government Bridge – presented fatal flaws that are discussed in detail in the report. **WSDOT cannot support these improvement options.**
- A 13-mile relocation west to a new Skagit River crossing and connection to SR 20 would take many decades to complete and WSDOT would still be required to respond to emergencies and imminent threats on the existing highway. Challenges for the relocation include presence of protected terrestrial species and a high likelihood of encountering archeological materials and historic resources. This relocation cannot be constructed in a way that will create incremental benefits. **WSDOT does not recommend this option; however, other governments or members of the public may choose to advocate for this strategy.**

Implementation strategy

1. Request that the legislature authorize full funding to complete the *SR 530/Sauk River Bank Erosion - Realign Roadway* project to avoid additional placement of riprap under emergency conditions and restore valuable fish habitat by moving the road away from the river. \$4.3 million additional funds are needed to fund the *Estimate at Completion*, including risks.
2. As part of the *SR 530/Sauk River Bank Erosion - Realign Roadway* project, remove existing riprap and return the old road prism to a natural state.
3. WSDOT and WDFW will lead the process to determine appropriate short-term next steps for the Sauk-Suiattle confluence site through adaptive management process.
4. WSDOT's Chronic Environmental Deficiency (CED) program will commence a scoping process which will assess the feasibility of a realignment or bank stabilization medium- to long-term solution for the Sauk-Suiattle confluence site in close coordination with tribes, regulatory agencies and other stakeholders.
5. WSDOT's CED program will commence work on a *Site and Reach Assessment* for the Skagit River Bridge site in close coordination with tribes, regulatory agencies and other stakeholders.



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**Washington State
Department of Transportation**

Introduction

SR 530 runs along the Sauk River from Darrington in Snohomish County to its confluence with the Skagit River near Rockport in Skagit County. Conflicts between SR 530 and the Sauk River pose constant problems for the natural environment and the traveling public. Floods and damage to the highway from erosion result in road closures and emergency project activities almost every year. The purpose of the corridor study is to evaluate these problems and settle on a reasonable strategy that fulfills our responsibilities to the traveling public and natural environment.

The study objective was to find a way for the river and highway to coexist to provide early, tangible benefits, preserve the function of the highway, minimize negative impacts to wildlife habitat, avoid washouts, minimize repetitive repairs, as well as work closely with tribes, permitting agencies, and other stakeholders.

The product of the corridor study is a plan to address conflicts between SR 530 and the Sauk River to guide WSDOT's work on the highway. WSDOT determined the recommendations in the corridor plan, with input from governments and members of the public.

What effect does the plan have?

What it does:

- Creates a project record that documents support and opposition to improvement strategies.
- Identifies improvement options that WSDOT cannot support.
- Identifies recommended improvements as system needs.

What it does not:

- It does not guarantee funding for improvements.
- It does not prioritize projects against other WSDOT needs.
- It does not prevent other governments or members of the public from advocating for a particular improvement.

Study schedule and process

We evaluated six realignment and relocation options based on several criteria:

- Is it feasible to safely construct and maintain?
- What benefit does it create? When would benefits be realized?
- What harm does it impose? When would the harm occur?
- How do the benefits compare to the harms?

Guiding principles

It would be irresponsible for WSDOT to support improvement strategies that do not meet the following commitments to the natural environment and traveling public.

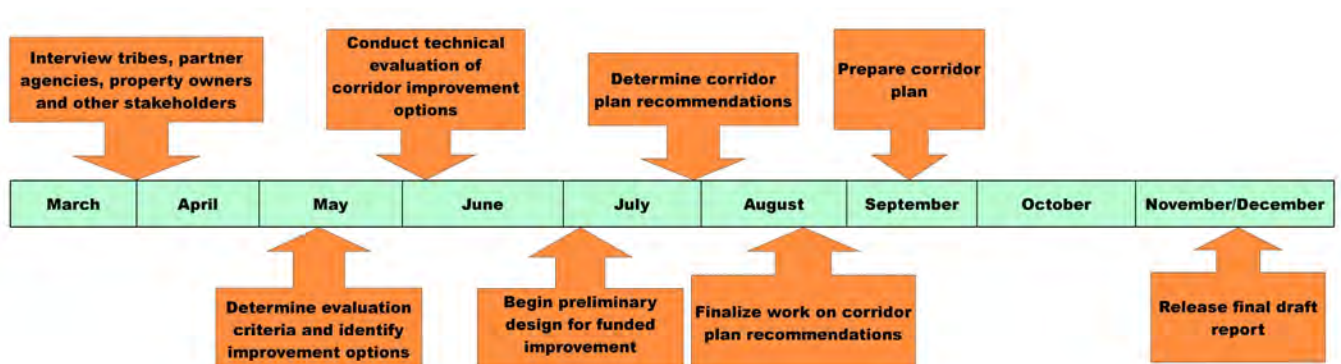
In order to provide a safe, functioning highway we must:

- Provide a viable and safe transportation corridor between SR 20 and Darrington.
- Have a short-term strategy for avoiding roadway failures.
- Follow federal and state standards for highway design.
- Comply with laws and regulations associated with existing access rights.

In order to protect the natural environment we must:

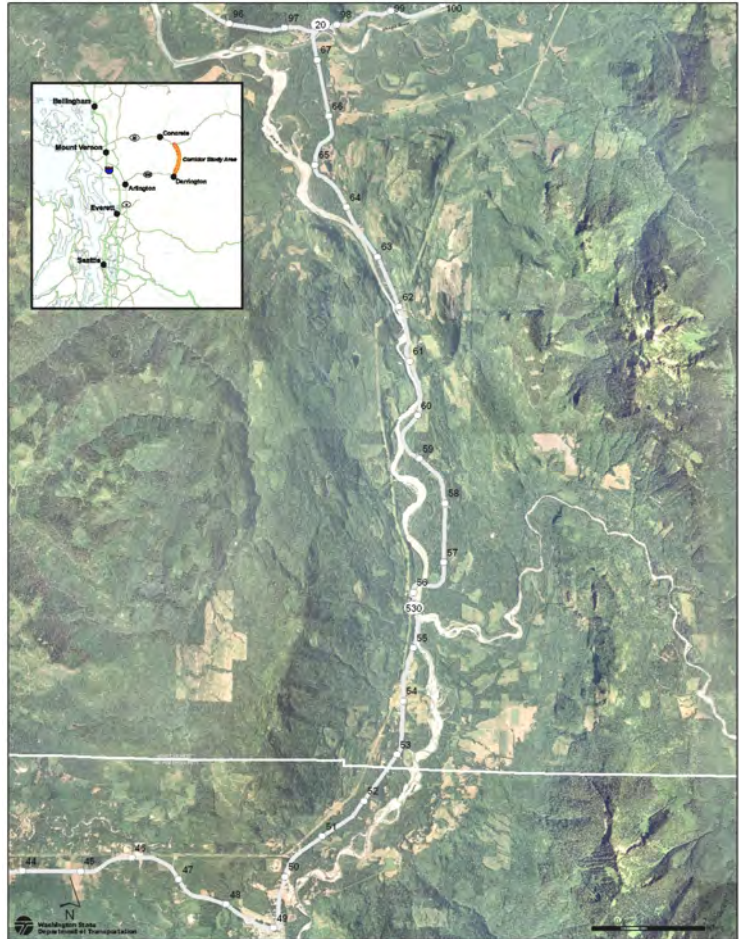
- Avoid or minimize additional negative impacts to fish and wildlife habitat and optimize mitigation when necessary.
- Comply with all environmental laws and regulations.
- Weigh the benefit created by a proposed highway improvement strategy against any negative impacts it generates to ensure that we do not do more damage to the natural environment than we alleviate.

Project schedule, March 2009 – December 2009



SR 530 project history

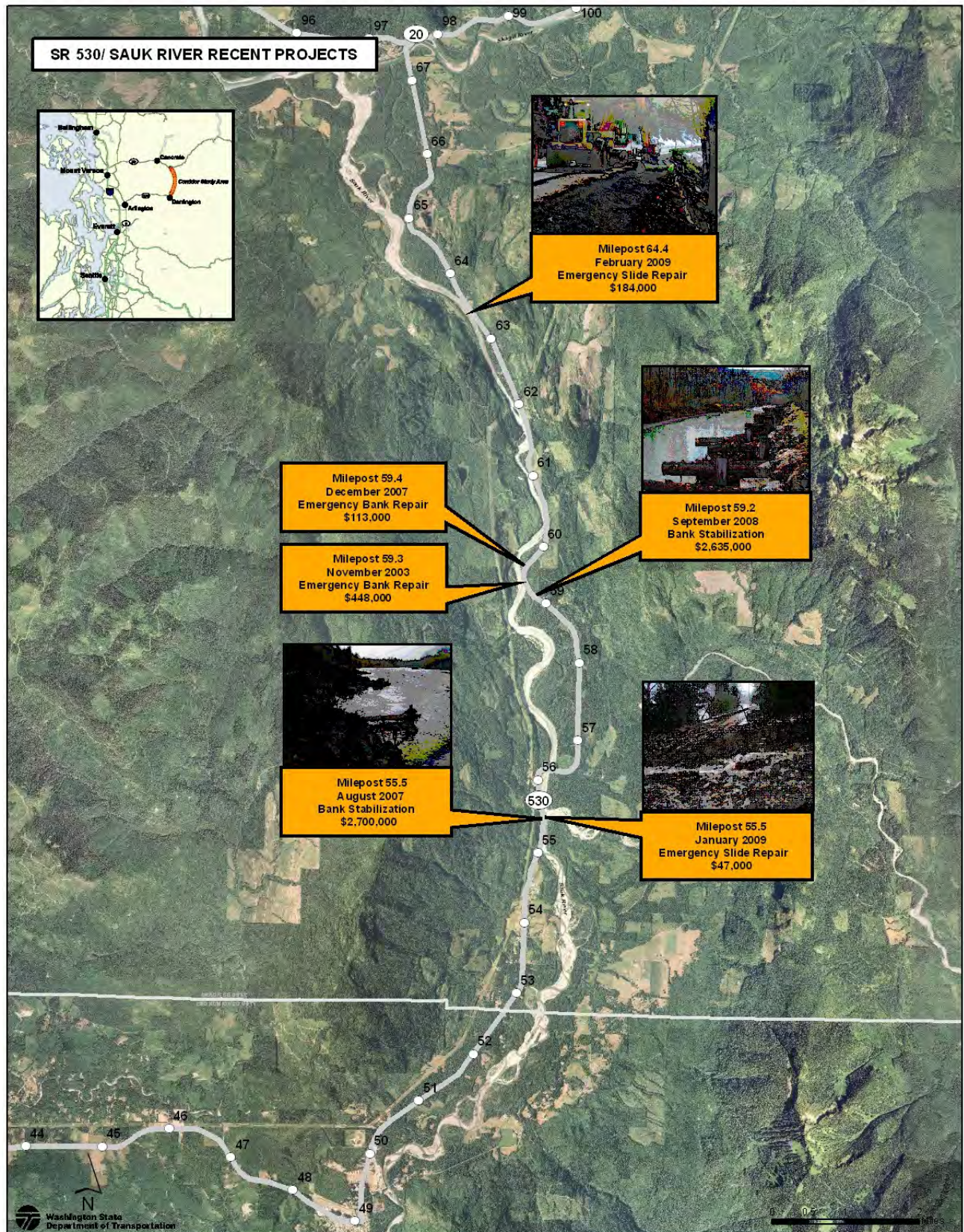
SR 530 was originally built as a logging railroad in 1917. The corridor was eventually converted to a road and was deeded to Skagit County in the mid 1950s; it was then deeded to WSDOT in 1984 and it became a state highway. SR 530 is traveled by approximately 980 vehicles travel in each direction daily. Trucks make up 15 percent of the traffic, as the route serves as a primary route for trucks carrying timber products. The highway serves as an emergency access route for the Sauk-Suiattle tribe, and provides access to private property in the area as well as to recreational areas along the corridor.



Highway/river conflicts

While the section of highway only runs along the river for a distance of 12 miles, it is one of the most problematic highway segments in the entire state. Numerous repetitive damage sites, unstable slopes, and eroding banks threaten the highway. Much of the route lies in the Channel Migration Zone (CMZ), an area the river has occupied in the past, and, therefore, may be susceptible to future erosion or channel occupation. Floods and damage to the highway from erosion result in road closures and emergency project activities almost every year.

Recent emergency repairs have been completed at MP 59.3, MP 59.4, and MP 64.4, with bank stabilization projects as well at MP 59.2 and MP 55.5. Without further action, the highway is vulnerable to collapse due to further erosion by the Sauk River.



Chronic Environmental Deficiency (CED) program projects

Chronic environmental deficiencies (CED) are locations along the state highway system where recent, frequent, and chronic maintenance repairs to the state transportation system are causing impacts to fish and fish habitat. In 2002, WSDOT established a partnership (Memorandum of Agreement) with the Washington Department of Fish & Wildlife (WDFW) to move away from the repetitive repair of WSDOT roads and instead, concentrate on long-term solutions that will optimize the improvements for fish and fish habitat, while also addressing transportation needs. As part of the MOA agreement, WSDOT produces annual reports that highlight CED accomplishments from previous years and discusses future plans.

CED projects generally have to meet two qualifiers:

- Maintenance has been conducted on the site 3 times in the previous 10 years
- The maintenance being conducted has a negative impact on aquatic fish habitat.

How are CEDs identified?

Potential CEDs can be nominated by WSDOT, WDFW, Tribes or other concerned parties. Nominations come to the CED coordinator who works with WSDOT region staff to identify possible CED projects. Nominations are screened to determine if the sites meet the program's criteria. The initial site assessment team consists of the CED coordinator, WSDOT's Senior Hydrologist, the Region Maintenance Environmental Coordinator, and persons familiar with the site verifying eligibility to the CED list and filling out an intake form with initial recommendations. Those projects meeting the criteria are added to the list of CED sites.



WSDOT Chronic Environmental Deficiency (CED) Program

Recently-completed and upcoming activities:

Sauk River/SR 530

Sauk River Corridor Analysis.

The corridor analysis and process came out of a value engineering study resulting in the construction of the Sauk River side channel log crib walls after experts identified a significant risk of the Sauk River mainstem occupying a sidechannel adjacent to SR530. Since 2003, WSDOT spent in excess of \$6.1 million on SR 530 between MP 50.0 and 65.0 to address conflicts between the highway and the Sauk River. Rather than continuing to perform repetitive repairs, Tribes and regulatory agencies requested that WSDOT consider moving the entire highway (or considerable portions of it) to avoid trouble spots. Those requests figure prominently in permit negotiations with these entities. The corridor study fulfills our commitment to those tribes and regulatory agencies to explore relocation and realignment options. The study began in Spring 2009 and will be completed in January 2010.

MP 59.3 Sauk River CED.

Funded in 2005, this project will realign $\frac{3}{4}$ of a mile of SR530 away from the river. In October of 2008, this project was put on hold at 30% design pending the outcome of the value engineering study referenced above, and the subsequent corridor analysis. The corridor analysis concluded that in the near term, short reroutes such as that proposed at MP 59.3, coupled with wood-based bank armoring projects, are the most viable strategy for maintaining a functional north-south transportation corridor while minimizing environmental impacts. The design of the reroute at MP 59.3 resumed July 1st 2009. If approved for the additional funding to complete construction, this project will go to Ad October 2010.

MP 58 Sauk River side-channel.

Concern grew in the fall of 2008 that this sidechannel may be occupied by the entire mainstem of the Sauk River, jeopardizing SR530 and the funded reroute project at MP 59.3. A value engineering study was conducted and participants agreed that immediate action was needed to prevent potential failure of the highway. Three cribwall structures were installed in October of 2008 that effectively protected the highway from impacts during a flood event 3 weeks later. There is potential for future work at this site but currently none is planned.

MP 56 Sauk-Suiattle Rivers confluence.

This site was identified as a concern after channel forming flows in November of 2006. An emergency site and reach assessment was conducted, and as a result 12 buried groins with 90 pieces of large wood were installed in the fall of 2007. High flows exposed some of the groins which were subsequently lengthened and 66 additional pieces of wood were added. Annual meetings between WDFW and WSDOT to monitor the performance of the groins are ongoing. The Skagit River System Cooperative nominated this site to the CED list in 2008 and it was incorporated into the corridor analysis referenced above. This site is identified as top concern for WSDOT and stakeholders. The CED program scoping process will assess the feasibility of a minor realignment relative to a long-term bank protection strategy along the current alignment at this site. A meeting with interested parties will occur in 2010.

MP 67 Skagit River Bridge site.

A site and reach assessment will be conducted at this site. A scope of work for this assessment will be made available early in 2010.

More information about WSDOT's CED program is available at:
<http://www.wsdot.wa.gov/Environment/Biology/FP/CEDretrofits.htm>

For each site, WSDOT conducts either a reach assessment, reach analysis or corridor analysis that evaluates and identifies the hydrologic mechanisms for failure and develops a conceptual design solution. In 2005, WDFW developed a prioritization methodology which provides a scientifically based priority to the order of CED correction.

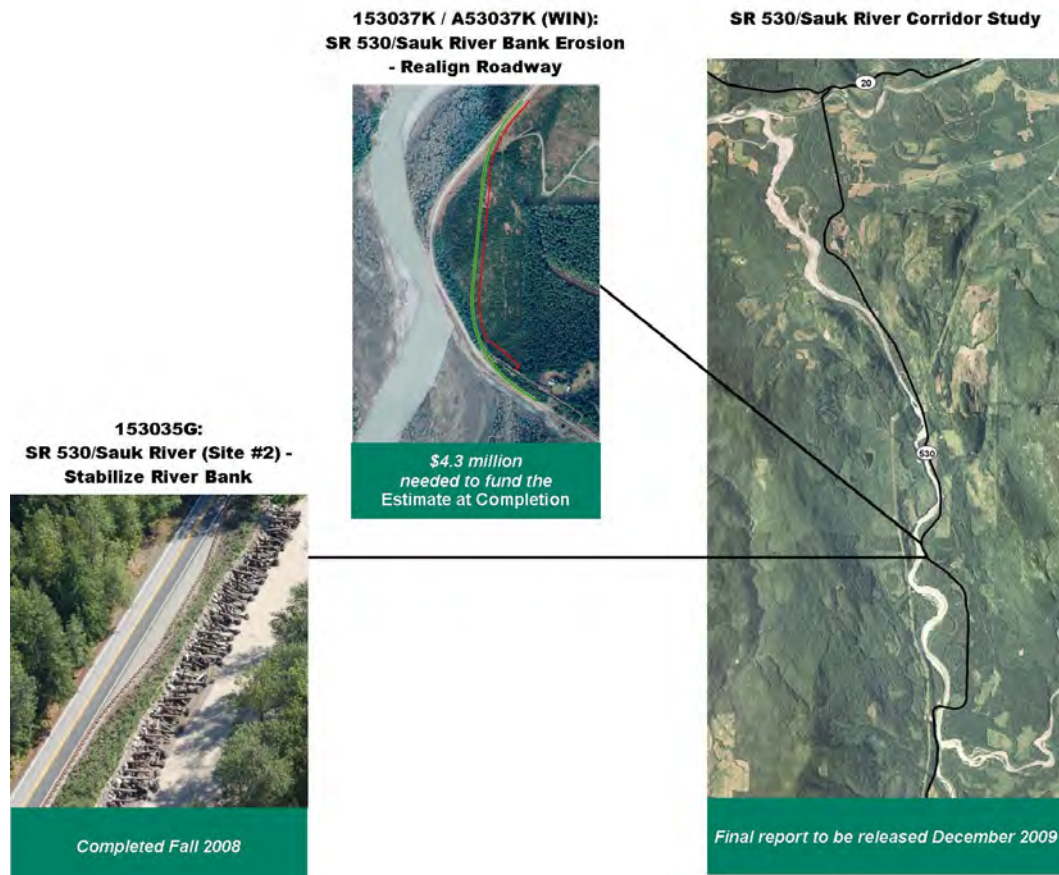
How does WSDOT fund CED projects?

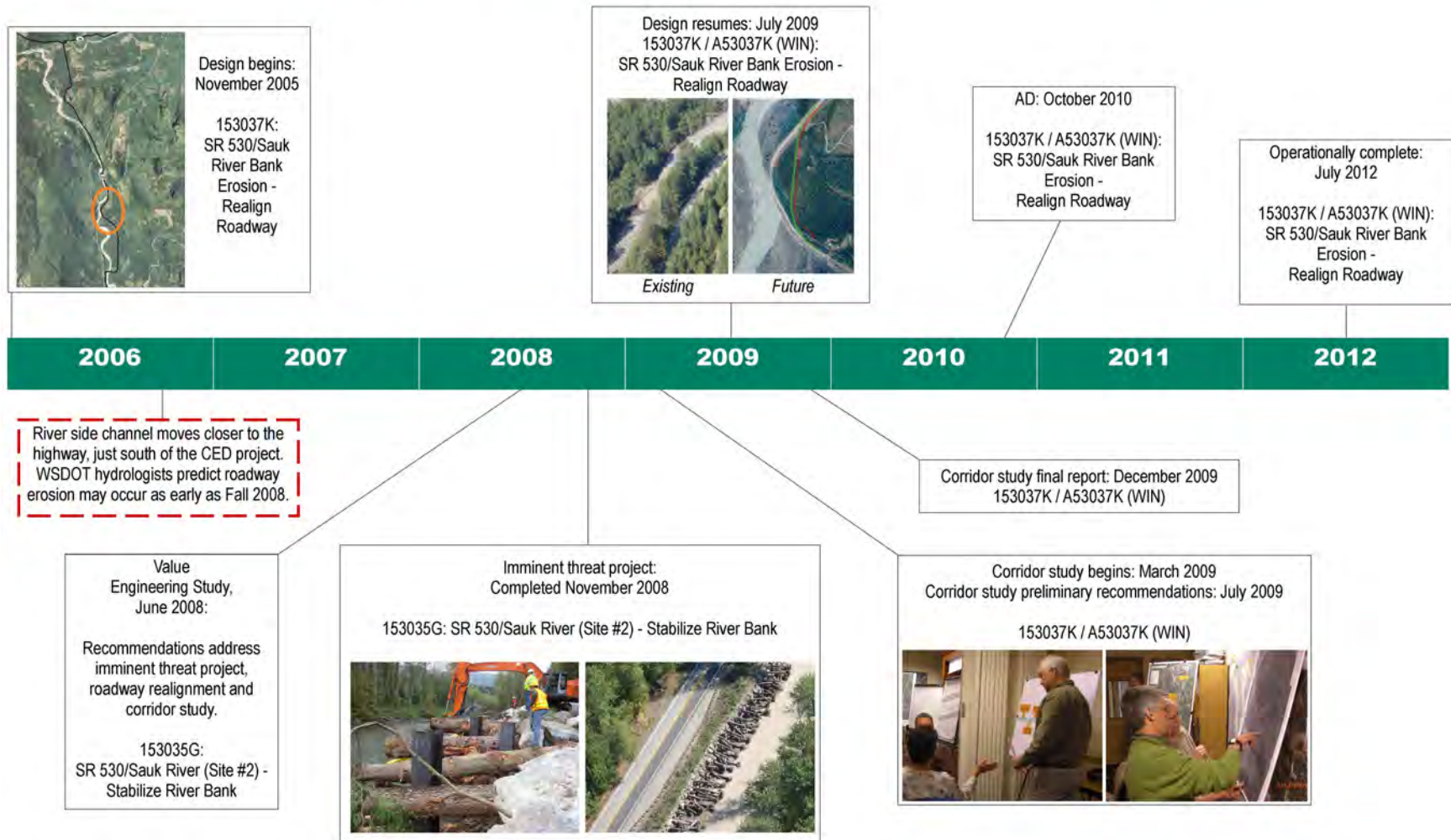
Those projects that qualify as Chronic Environmental Deficiencies can be addressed with project funds, some as emergencies or with bridge funds, and others can be addressed as line item projects funded by the legislature under Improvement - Environmental Retrofit.

What has been accomplished so far?

Since WSDOT launched the CED program in 2004, 11 high priority sites have gone through the process of reach assessments/analysis, design, and construction to correct the deficiencies. There are currently 15 CED projects funded for \$72 million to design and construct by 2011. The CED program has saved maintenance cost, reduced the loss of commerce due to road closures, removed or reused riprap and other material damaging aquatic habitat, and replaced them with rough woody structures designed to enhance salmonid habitat.

Due to the severe highway/river conflicts in this corridor, SR 530 has been the focus of numerous CED activities in recent years.





Coordination

Rather than continuing to perform repetitive repairs, Tribes and regulatory agencies requested that WSDOT consider moving the entire highway (or considerable portions of it) to avoid trouble spots. Those requests figure prominently in permit negotiations with these entities. The corridor study utilized a collaborative approach to respond to these concerns.

We implemented a reasonable strategy to involve stakeholders early and often in the process while ensuring that we achieve a measurable outcome in a reasonable amount of time. WSDOT led the technical analysis at the request of stakeholders and due to our unique qualifications and experience. At the same time, we utilized Skagit River System Cooperative/USFS data, hosted a small technical group meeting to discuss the channel migration zone analysis, utilized technical input provided by Washington Department of Natural Resources and sent progress reports between meetings to invite input. Our focus, both at the beginning and the end of the study process, was on collaboration. We conducted numerous individual interviews early on to ensure adequate time to listen to each group's concerns, and hosted a group workshop at the end of the process to develop the implementation plan.

Who did we interview, and what did we learn?

We interviewed tribes; federal, state, and local agencies; property owners and other stakeholders with interests in SR 530. We learned throughout the interview process that the main goals were to: maintain a functioning highway, protect fish habitat, minimize ground disturbance, protect "Wild and Scenic River" values, protect private property, and protect endangered species habitat. Some comments we heard were:

- Fish habitat is a high priority.
- Preserve access to private properties.
- The reactive approach is a problem. WSDOT should be more proactive.
- Consider impacts to terrestrial species as well as impacts to fish and fish habitat.
- Don't rule out options solely based on cost.

Decision-making process

We used research and technical analysis to evaluate each of the improvement options based on our evaluation criteria. This process is not a numerical formula that calculates the correct answer; rather, the information helps point out advantages and disadvantages of each option and assists in making an informed recommendation.

Roles and responsibilities

The Washington State Legislature ultimately determines how state highway funds are distributed for projects across the state. Federal funds are divided: some are dispersed to the state for distribution to projects; some are dispersed to regional planning organizations for distribution as grants for local agencies; and some are reserved for dispersal to specific projects. These funds are focused primarily on safety and mobility needs.

Washington must prioritize projects because the state's highway needs far exceed the funds available to address them. Projects are prioritized based on the legislature's policy goals of preservation, safety, mobility, environment and stewardship. As a cabinet agency that reports to the governor, WSDOT identifies project priorities through the Highway System Plan process and relies on direction from the governor and legislature to allocate state and federal funds.

WSDOT is bound by certain limitations when developing a study such as this one. One of those limitations is that we must have a plan that can address transportation needs within a 20 year timeframe. A conclusion that a certain improvement option or strategy is "not recommended" means only that it is not the recommended strategy for WSDOT to pursue in the next 20 years. It does not prevent other governments or members of the public from advocating for a particular improvement.



Evaluating improvement options

There are many ideas about how to address conflicts between the river and highway. The purpose of the corridor study is to evaluate these ideas and settle on a reasonable strategy that fulfills our responsibilities to the traveling public and natural environment.

Our technical analysis involved a diverse team of experts to provide a multi-disciplinary review of these improvement options. The team included specialists in geotechnical engineering; geomorphology/channel migration zone analysis; biology; cultural resources and archaeology; environmental permits and documentation; and transportation planning and highway design. Per input from stakeholders, our analysis included an assessment of costs but did not emphasize financial impacts. Rather, our evaluation focused on the comparative benefits and disadvantages associated with each improvement option. The first portion of our analysis focused on evaluating the various strategies for addressing highway/river conflicts. After selecting a suitable strategy, we then shifted our efforts to prioritizing short-term actions for the corridor.

Our analysis was designed to provide a broad-brush review of the issues involved to facilitate discussion between WSDOT and stakeholders regarding the pros and cons of various types of improvements. It was a high-level evaluation. There are numerous modified alignments that could be considered and optimized. However, our focus on comparative benefit, construction feasibility and factors driving cost produced a solid foundation of information for the conclusions we offered in the summary report. This level of detail is adequate for this stage in the project planning and development process.

Which improvement options did we evaluate?

We evaluated six improvement options that span the breadth of relocation and realignment proposals under discussion in the last several years. The set of options was finalized with input from stakeholders.

- 1 – No action – respond to emergencies only
- 2 – Imminent threat
- 3 – Minor realignments
- 4 – Major relocation east
- 5a – Major relocation west to Government Bridge;

Guidance for our evaluation – May 2009

We will use research and technical analysis to evaluate each of the improvement options based on our evaluation criteria. This process is not a numerical formula that will calculate the correct answer; rather, we will use the information to point out advantages and disadvantages that will inform our recommendation.

Our analysis may find that some improvements that would further reduce highway/river conflicts exceed funding we can reasonably expect to be available in the next 20 years. We may not currently have the funding needed to complete these improvements, but that doesn't mean that the long-term solution will never happen. There may be funding sources available in the future that we haven't yet anticipated.

5b – Major relocation west to SR 20

Following our detailed evaluation of these options, we also addressed several variations of these alternatives.

How did we evaluate improvement options?

The following criteria, developed based on feedback gathered during our interviews, guided our technical analysis and revealed advantages and disadvantages associated proposed improvement strategies.

Transportation

- Extent to which improvement option maintains and enhances safety
- Likelihood of roadway failure
- Potential for erosion
- Extent of likely repetitive repairs
- Extent to which improvement option produces long-term solutions
- Maintenance costs
- Extent to which improvement option affects access to private residential property, resource lands and recreation opportunities
- Extent to which improvement option produces early, tangible benefits

Environment

- Extent to which improvement affects fish, wildlife and plant species
- Extent to which improvement affects “Wild and Scenic River” characteristics
- Extent to which improvement option produces early, tangible benefits

Cultural Resources

- Extent of impacts to cultural resources and sites

Land Use Activities

- Extent of impacts to existing activities including residential, resource management and recreation

Constructability

- Likelihood that improvements can be constructed incrementally
- Potential for securing necessary funding
- Complexity of engineering, permitting, and construction

Funding considerations

While this plan necessarily addresses an extensive range of needs, we have an obligation to consider what can be accomplished within the limits of available funding. Given the structure of existing funding programs, monies available for projects that resolve highway/river conflicts are extremely limited. As an illustration, the estimated budget for Washington's Chronic Environmental Deficiency (CED) statewide is \$72 million for projects to be constructed by 2011. WSDOT is seeking an additional \$200 million to fund project needs for construction by 2015; of this, only about \$30 million has been secured. More information about how gas tax revenues are generated and dispersed in Washington is provided on the following page.

Stakeholders requested that we not rule out options solely due to funding constraints. We followed this guidance; however, it was necessary for us to develop cost estimates for each of the options in order to complete our comparative analysis.

Our analysis found that some improvements that would further reduce highway/river conflicts exceed funding we can reasonably expect to be available in the next 20 years. We may not currently have the funding needed to complete these improvements, but that doesn't mean that the long-term solution will never happen. There may be funding sources available in the future that we haven't yet anticipated. Lack of funding does not represent a fatal flaw in any of the improvement options.



Where does the gas tax go?

37½¢ per gallon Washington State gas tax rate as of July 1, 2008



-9½¢

goes to 257 specific transportation projects statewide*
(2005 Transportation Partnership Projects)

Washington's Future Just Got Better
MAKING EVERY DOLLAR COUNT.

28¢



-5¢

goes to 130 specific transportation projects statewide
(2003 Nickel Package projects)

**IT'S YOUR NICKEL.
WATCH IT WORK.**

23¢



-11¢

goes to cities and counties for local roads

12¢



-4¢

goes to pay off bond debt that funded past highway and ferry projects



8¢

is left for maintenance and operations as well as preservation, safety improvements, and congestion relief projects for state highways and ferries

How much does the state gas tax cost you each year?

If you drive 12,000 miles a year:

Miles per gallon	Base 23¢ Gas Tax	2003 5¢ Gas Tax	2005 9.5¢ Gas Tax	Total Annual State Gas Tax
30	\$92	\$20	\$38	\$150
20	\$138	\$30	\$57	\$225
10	\$276	\$60	\$114	\$450

The nickel tax will be eliminated when all bonds associated with it have been paid. This will occur about 25 years after the last bond issue is sold. (according to the current financial plan the tax will be eliminated sometime in 2046)

*Of the 9½ cents, 8½ cents is used by the state for highway projects, 1 cent goes to cities and counties for improvements to streets and roads.

The 2003 Funding Package funded 160 projects statewide. 130 projects are funded through the nickel gas tax, the other 30 projects utilize multimodal funds provided from increases in various licenses, permits, and fees, as well as an increase to the sales tax on new and used vehicles.

The 2005 Funding Package funded 274 projects statewide. 257 projects are funded through the 9.5¢ gas tax increase, the remaining 17 are funded through the multimodal program from increases to various licenses, permits, and fees as well as a vehicle weight tax.

Effective July 1, 2008

Results

Improvement options evaluated

Option 1 – Respond to emergencies only

Not recommended as a planned strategy.

Option 1 prevents or allows a timely response to catastrophic failure of the roadway, but does so at a high cost to aquatic species and habitat. While emergency actions typically do not allow for full involvement of permitting agencies and there is little time to adequately assess impacts to fish habitat, it is known that rip rap revetments reduce the quality, distribution and type of fish habitat. Rip rap revetments performed in an emergency require intensive maintenance and have a relatively short life span, so ongoing costs are high. Mitigation follows these projects when time and funding allow. This option produces minimal benefit and creates potentially significant harm. WSDOT can only support this option as a last resort to avoid roadway failure or respond to a recent failure, and does not recommend emergency action as a planned strategy for addressing problems in the corridor.



Option 2 – Imminent threat

Recommended

This option is slightly more proactive than option 1 – it allows for a more deliberative design and permitting process and therefore may incorporate mitigation actions into the design. While the total cost for completing armoring along the high risk segments of the highway is significant, costs can be divided into individual projects that are eligible for existing programs and may be timed consistent with need and availability of funding. The option maintains access to properties along the corridor at a low maintenance cost and low likelihood of the need for repetitive repair. It is probable that this option would involve in-water work that can be harmful to fish and fish habitat. This option does not reduce the effect of the highway as a barrier to the natural hydrodynamic processes of the Sauk River.





Option 3 – Minor realignments

Recommended

Minor realignments appear to balance benefits and disadvantages, but are not always feasible to construct. This option reduces the effect of the highway as a barrier to the natural hydrodynamic processes of the Sauk River, relieves aquatic species and habitat of some of the effects of armoring, and reduces the need for in-water work. For example, the proposed realignment at milepost 59.5 would allow a geotechnical setback of at least 2:1 and as much as 4:1 through most of the proposed route. The option would maintain access to properties along the corridor provided that it included armoring of remaining highway sections. Minor realignments involve a low maintenance cost and a low likelihood of the need for repetitive repair. Finally, this option can provide incremental benefit: while the total cost for completing armoring along the full length of the project is significant, costs can be divided into individual projects that are eligible for existing programs and may be timed consistent with need and availability of funding. Minor realignments may be most appropriate in locations where log crib wall options may not be viable due to constructability and slope stability concerns.



Option 4 – Relocation east

WSDOT cannot support this option.

Option 4 involves a full realignment east of the existing highway corridor. In the case of option 4, WSDOT Geotechnical Division determined that alignment options on the east side of the existing highway, north of milepost 61, are essentially nonexistent for geometric and geotechnical reasons. An alignment situated on the valley wall would be exposed to significant unstable slopes hazards (debris flows, landslides and rockfall) that could likely not be adequately

stabilized to protect highway traffic.

Furthermore, there are rigid seismic constraints for the design of major structures on steep ground, and it does



not appear to be feasible to meet those rigid constraints in the steep terrain in this portion of the relocated highway. Such conditions would not allow us to provide a safe and viable transportation corridor, so WSDOT cannot support Option 4.

Option 5a – Relocation west to Government Bridge

WSDOT cannot support this option.

Option 5a would be constructed in an area with steep terrain, but the WSDOT Geotechnical Division determined that with significant rock blasting and construction of retaining walls, the alignment could be designed to avoid major hazards. The benefit of this option is limited since the portion of the existing highway it replaces includes the least threatened section of SR 530. Therefore, this relocation produces minimal benefit for aquatic species and habitat, and does not significantly reduce the effect of the highway as a barrier to the natural hydrodynamic processes of the Sauk River. Instead, it installs a new roadway in habitat suitable for protected species, contributes to significant reduction in forage area and may compromise wildlife passage permeability. In addition, this option aligns in close proximity to a known archaeological site. Finally, the existing highway could not be removed unless access rights to properties that rely on SR 530 are purchased. If the access rights are not acquired, and the existing highway remains intact, armoring and/or emergency action would be necessary. The advantages appear to be outweighed by the disadvantages, so WSDOT cannot support Option 5a.



Option 5b – Relocation west to SR 20

Not recommended.

Option 5b involves a full realignment west of the Sauk River extending north across the Skagit River. This option may produce significant benefits, but does so at significant environmental and financial cost. This relocation could significantly reduce the effect of the highway as a barrier to the natural hydrodynamic processes of the Sauk River, but *only* if the access rights to properties that rely on SR 530 are purchased so the existing highway can be removed. If the access rights are not acquired, and the existing highway remains intact, armoring would be necessary and

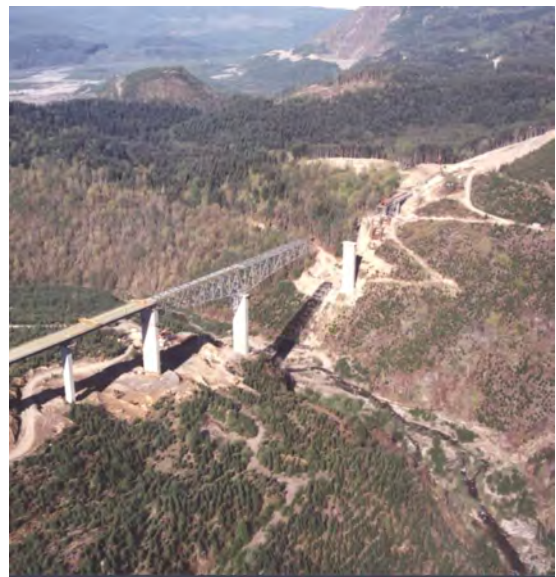


benefits to aquatic species and habitat would not be realized. In either case, it would be necessary to complete imminent threat or emergency action projects to avoid failure of the existing highway until the relocation is completed.

This option could be divided into two large phases. The first would construct the new western alignment from the south to the county bridge at MP 61, then follow the existing alignment north to SR 20. The second phase would construct the remainder of the alignment north from the county bridge to SR 20 across the Skagit River. However, the extreme topography and lack of other roadway connections make any further incremental improvements infeasible, and would constitute a “road to nowhere.” It would be necessary to secure funding for the cost of an entire phase at one time to construct this relocation.

Construction of this option would contribute to significant loss of terrestrial habitat and introduces approximately 50 new stream crossings. This western alignment would be constructed, and would operate, within habitat that is currently occupied by protected species, including marbled murrelets and spotted owls. The introduction of vehicle traffic would fragment habitat and likely disrupt nesting actions. With its requirement for a new crossing of the Skagit River, this option also has a high potential for interference with nesting and roosting of bald eagles. This relocation aligns in close proximity to a known archaeological site, and due to construction at the Skagit River, is the option with the greatest probability of encountering undiscovered archeological materials and/or historical resources.

Areas north of the county bridge at milepost 61 include significant areas of unstable slopes; however, WSDOT Geotechnical Division determined that with significant rock blasting and construction of retaining walls, the alignment could be designed to avoid major hazards. Multi-span bridges, taller than 100 feet, would be required to cross several significant drainages. The channel of the Skagit River at the proposed crossing appears highly unstable. A 250-ft-high steep slope forms the north (right) bank of the Skagit River, requiring either a very high (approx. 200 ft) and long (approx. 3000 ft) bridge and/or a deep (approx. 200 ft) and long (greater than 1 mile) through-cut to join SR 20.



Other options considered

Relocation west to SR 20

We also considered an option that would merge Option 5b, Western Relocation to SR 20 with the county's Concrete Sauk Valley Road. This change would be an alternative to the construction of a new bridge over the Skagit River as proposed in Option 5b. Our evaluation of this option gathered background information to serve a discussion of benefits and disadvantages. There are quite a few issues that would have to be addressed in order to bring the route up to highway standards. Some of the issues are:

- Vulnerability of the road to Skagit River channel migration
- Protected species
- Wetlands
- Stable slopes
- Changes in traffic patterns
- Traffic impacts to Concrete, Rockport
- Stormwater management
- Proximity of utilities to existing roadway
- Consistency with highway design standards (widths, curves, etc.)

Sauk-Suiattle Confluence Roadway Realignment – Option A

This improvement would realign the highway away from the river up on the adjacent hillside, and involves large amounts of cut and fill walls to minimize impacts to sensitive areas and to reduce exposure to potentially unstable slopes. If constructed, it would move a highly vulnerable section of highway out of the channel migration zone. However, there are several drawbacks. The realignment would affect a known archeological site, and considerable cut and fill and structural walls through unstable materials would be required. The alignment would also require a sharp horizontal curve that does not meet highway design standards. We could not confirm that construction is feasible until a design deviation was approved and there are no guarantees that it would be approved. Most importantly, a cut and fill slope alternative would not be feasible (cut slopes would extend very high up the hillside and fill slopes would extend down into the river), so the realignment would involve cut and fill walls exceeding 30 feet that would require a special design. If WSDOT's Bridge and Structures specialists determined that these walls cannot be constructed based on geotechnical data, then this option would become impractical.





Sauk-Suiattle Confluence Roadway Realignment - Option B

This improvement would realign the highway away from the river up on the adjacent hillside, requiring an elevation gain of 130 feet. This option would move a highly vulnerable section of highway out of the channel migration zone, but it also involves significant drawbacks. The realignment would affect a known archeological site, and considerable cut and fill and structural walls through unstable materials would be required. The alignment would require a sharp horizontal curve that does not meet highway design standards, and would also require a grade that exceeds highway design standards. We could not confirm that construction is feasible until design deviations were approved. Even if they were, this unusual terrain may present a challenge in wintery conditions and could potentially be a blockage point in a route that is more or less level and present potential safety hazards. Although the realignment would include a truck climbing lane, such a significant change in grade could pose a problem for log trucks that depend on this route.

Eastern realignment terminating south of White Creek

The option would involve large cuts and fills, but otherwise does not appear to have any fatal flaws or significant geotechnical concerns. Disadvantages of this option include the need for considerable property acquisition, challenges related to retaining access to private property and construction of a lengthy alignment. Benefits would be similar to those generated by the combination of the log crib wall and minor realignment at milepost 59.5.

The bottom line

All of the options require substantial investments, and each has benefits and tradeoffs for the natural environment. WSDOT cannot support Option 4 because an alignment that can be constructed to protect the safety of travelers is essentially nonexistent. We cannot support Option 5a due to the lack of benefits provided by that relocation. Option 1 is an emergency strategy only, and does not constitute a proactive plan to addressing problems in this corridor. That leaves three options: Option 2, Imminent threats; Option 3, Minor Realignments, and Option 5b, Western relocation to SR 20.

Option 5b, Western relocation to SR 20, may produce significant benefits, but does so at significant environmental and financial cost. Detailed engineering would be required to more fully understand the comparative benefits and disadvantages of this option, and to determine its feasibility in terms of constructability and funding.

Because WSDOT has a responsibility to maintain a safe, viable transportation corridor, we must have a short- and mid-range strategy to avoid roadway failure while minimizing negative impacts to the environment. If it were determined that Option 5b has benefits that exceed the disadvantages, it would take decades to obtain funding and then design and construct, leaving us with a need to continue to pursue improvements of the existing

highway. Given this constraint, our conclusion is that we should move forward with a mix of Options 3 and 2.

While WSDOT must have a plan to address corridor needs in the next 20 years, our recommendation does not prevent other governments or members of the public from advocating for Option 5b.

Implementation Plan

Because WSDOT has a responsibility to maintain a safe, viable transportation corridor, we must have a short- and mid-range strategy to avoid roadway failure while minimizing negative impacts to the environment. Our evaluation of improvement options determined that a combination of bank stabilization and minor realignment projects is the best improvement approach for the next 20 years.

Representatives from Tribes and regulatory agencies, and local property owners, attended a workshop on September 10, 2009 to discuss implementation strategies for SR 530. WSDOT presented an update to its channel migration zone analysis, and the group utilized the information to prioritize at-risk locations along the existing highway. Following the meeting, the USFS provided information about additional locations that should also be considered vulnerable to channel migration.

Improvement strategy

WSDOT identified six erosion hazard sites and one avulsion hazard site for prioritization in terms of the potential need for future highway protection activities. With the possible exception of two sites, all of the erosion hazard sites appear to be conducive to the construction of log crib walls or crib benches if the decision is made to maintain the road in its current alignment. Because they have a comparatively smaller footprint and incorporate large volumes of large woody debris, these treatments have fewer negative impacts and convey superior environmental benefits than most other traditional types of bank stabilization design.

Short-term priorities

#1: Confluence to Steel Bridge (MP 55.5 to MP 56.2).

This is an area of high river migration and instability, largely due to sediment inputs from the Suiattle River. For this reason, the need for additional work at this site is highly likely. As such, it is an area of severe risk and is equally important as the site at MP 59-60 in terms of being the highest priority for additional treatment.

This site is the location of an active adaptive management process stemming from HPA permit requirements for previous emergency bank stabilization projects. Short-term augmentation of the bank stabilization emplacement here will be determined by the adaptive management process, as agreed to by WSDOT and WDFW. The medium- to long-term solution at this site will be determined through the CED scoping process, which will assess the feasibility of a minor realignment relative to a long-term bank protection strategy along the current alignment at this site. This ranking is provisional depending upon the outcome of feasibility studies examining realignment of the highway in this vicinity.



#1: SR 530/Sauk River Bank Erosion - Realign Roadway project (MP 59 to MP 60). Length is approximately 3,000 feet. It consists of a high, steep riprap slope ranging from 20 to 40 feet in height. It is steeper than the proper angle of repose (1.5:1) for riprap and is thus inherently vulnerable to failure. Several large emergency riprap repairs have been implemented at this site. The river strikes the toe of the slope at a high angle of attack. As such, it is an area of severe risk and is equally important as the confluence site on the list of high priority treatment sites.

The gradient of the slope and the angle of attack by the river thalweg indicate that relocation of this highway segment away from the slope is the best option. It is important to note that because of its height the log crib wall options that lend themselves well to the other existing and potential sites within the corridor may not be viable options at this site due to constructability and slope stability concerns. This ranking is also provisional, as moving forward with the relocation would greatly reduce (if not eliminate) the need for further bank stabilization activities at this site. The realignment allows a geotechnical setback of at least 2:1 and as much as 4:1 through most of the proposed route (see Figure 5).

#2: Skagit River Bridge site (MP 67.2 to MP 67.34).

This is a potential avulsion site. The Skagit River is threatening to avulse into a side channel on the left bank of the Skagit River. This side channel is bisected by the fill prism for SR 530 and its approach to the Rockport bridge. If this occurs, there is a high likelihood of catastrophic highway failure. Because of the high rate of channel migration in this area and the potential level of damage that an avulsion here could cause, this site is ranked at number 2. A *Site and Reach Assessment* is planned for this location under the auspices of WSDOT's CED program.





Action items

1. Request that the legislature authorize full funding to complete the *SR 530/Sauk River Bank Erosion - Realign Roadway* project to avoid additional placement of riprap under emergency conditions and restore valuable fish habitat by moving the road away from the river.

Fully funding the realignment at MP 59.5:

- Implements study recommendations.
- Fulfills our prior emergency project permit conditions.
- Keeps the project in good standing with the agencies and tribes.
- Is supported by nearby residents.
- Results in a long-term solution to the CED problems experienced at this location.

\$4.3 million in additional funding is needed to fund the *Estimate at Completion*, including risks.



2. As part of the *SR 530/Sauk River Bank Erosion - Realign Roadway* project, remove existing riprap and return the old road prism to a natural state.

3. WSDOT and WDFW will lead the process to determine appropriate short-term next steps for the Sauk-Suiattle confluence site through adaptive management process.

4. WSDOT's Chronic Environmental Deficiency (CED) program will commence a scoping process which will assess the feasibility of a realignment or bank stabilization medium- to long-term solution for the site in close coordination with tribes, regulatory agencies and other stakeholders.

5. WSDOT's CED program will commence work on a *Site and Reach Assessment* for the Skagit River Bridge site in close coordination with tribes, regulatory agencies and other stakeholders.

Conclusion

Tribes, regulatory agencies and the legislature asked us to evaluate relocation options that would move the highway outside of the channel migration zone and determine whether proposed bank stabilization and realignment projects are a worthwhile investment. The corridor study utilized funds set aside for the Chronic Environmental Deficiency project at MP 59.5 to answer these questions.

What we learned

There is a feasible relocation option.

More work is needed to weigh the benefits against the drawbacks, but the preliminary evaluation provided by this study suggests that a major relocation of the highway to the west side of the river is feasible. We also know that, given existing funding mechanisms, it is extremely unlikely that it would be constructed in the next 20 years. Why? An improvement of that magnitude would likely exceed \$300 million. Because it cannot be constructed in phases, that funding would be required all at once. In addition, the accrual of benefits depends on removal of the existing highway, which would require acquisition of access rights from each of the properties that currently rely on the existing highway.

Bank stabilization and realignments are the only strategies that will produce benefits in the next 20 years.

Because relocation to the west, if pursued, is a long, long-term option (exceeding 20 years), it remains critically important to ensure that the existing highway continues to serve as a viable transportation corridor. Rip rap treatments generally associated with emergency actions are not desirable due to their negative impacts on river values (i.e. fish and free flow characteristics), but bank stabilization and realignment, when closely coordinated with tribes, regulatory agencies and other stakeholders, can provide benefits that avoid or minimize negative environmental impacts and optimize mitigation. These are the right tools to use in the next 20 years.

Roles and responsibilities in pursuing improvements

WSDOT is bound by certain limitations when developing a study such as this one. One of those limitations is that we must have a plan that can address the needs within a 20 year timeframe. Bank stabilization and realignment, when closely coordinated with Tribes, regulatory agencies and other stakeholders, can provide benefits that avoid or minimize negative environmental impacts and optimize mitigation within a 20-year timeframe. WSDOT will focus on this strategy in coming years.

Our evaluation suggests that full relocation of the highway to the west may be feasible. While it is not clear whether the benefits of constructing Option 5B outweigh the

disadvantages, it is clear that the likelihood of securing the necessary \$300-400 million in the next 20 years is extremely low. WSDOT's conclusion that this option is "not recommended" means only that it is not the recommended strategy for WSDOT to pursue in the next 20 years. It does not prohibit other governments and stakeholders from seeking funds for additional feasibility analysis, design, and ultimately construction of this option.

Next steps

SR 530/Sauk River Bank Erosion - Realign Roadway project

Preliminary engineering for the partially-funded realignment at MP 59.5 is underway. The project is set for 60 percent constructability review in spring 2010, and 90 percent constructability review in summer 2010. If needed construction funds are secured, the project will be advertised in December 2010 and will begin construction in spring 2011.

CED program activities for SR 530

WSDOT will proceed with funded CED analysis efforts in 2010.

- *MP 67.2 to MP 67.34 Skagit River Bridge site:* A site and reach assessment will be conducted at this site. A scope of work for this assessment will be made available early in 2010.
- *MP 56 Sauk-Suiattle Rivers confluence:* Annual meetings between WDFW and WSDOT to monitor the performance of groins installed in fall 2007 are ongoing. A CED program scoping process will assess the feasibility of a minor realignment relative to a long-term bank protection strategy along the current alignment at this site.



Appendix

A. Interviews – Spring 2009

B. May 13, 2009 meeting materials

C. Final technical evaluation

1. Executive Summary
2. Technical Evaluation Report
3. Channel Migration Zone Analysis
4. Endangered Species, Wetlands and Habitat Connectivity
5. Environmental Permits and Documentation
6. Cultural Resources
7. Geotechnical Report
8. Design Evaluation
9. Land Use Assessment

D. July 24, 2009 meeting materials

E. September 10, 2009 workshop materials

F. Implementation Plan

G. Participant feedback

H. Project reporting

Appendices are available by request; please contact Project Engineer Shane Spahr at spahrs@wsdot.wa.gov or 360.757.5856.